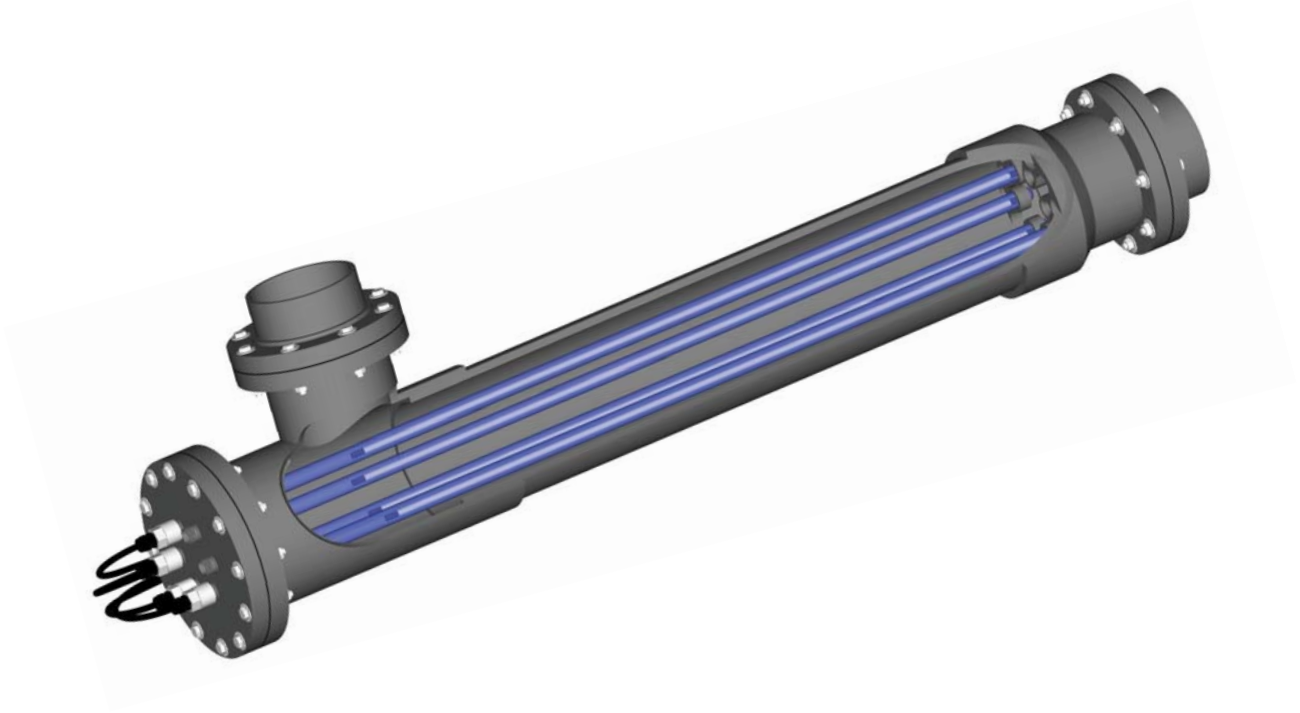




AQUATIC ECO-SYSTEMS™

# SMART UV MULTILAMP SERIES

## UV STERILIZATION SYSTEM



# INSTALLATION AND USER'S GUIDE

IMPORTANT SAFETY INSTRUCTIONS  
*READ AND FOLLOW ALL INSTRUCTIONS*  
SAVE THESE INSTRUCTIONS

## CUSTOMER SERVICE / TECHNICAL SUPPORT

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If you have questions about ordering Pentair Aquatic Eco-Systems™ replacement parts and products, please use the following contact information:

### Customer Service

8 AM to 7 PM — Eastern and Pacific Times

### Web site

Visit [www.pentairaes.com](http://www.pentairaes.com)

### US

Phone: (877) 347-4788

Fax: (407) 886-6787

### International

Phone: (407) 886-3939

Fax: (407) 886-4884

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# SECTION ONE

## INTRODUCTION

### General Information

In this manual you will find user information for your SafeGUARD™ CLP Series UV Sterilization System. It is an important document for safety guidance, installation, operation and maintenance. Read and understand all sections of this Manual before starting the installation or operation of this UV system. Strictly follow this Manual and all safety notes, they are for your own safety.

Custom-made, project specific modifications of the UV system and/or additionally integrated components may result in non-conformity of the system and void the warranty.

The information contained in this manual represents our most recent experiences and technical knowledge. This information does not hold a legally binding promise of certain characteristics or suitability for a specific application. The user of the UV system will be required to perform his/her own verifications and safety measures.

Pentair Aquatic Eco-Systems, Inc. accepts no responsibility for any problems arising from incorrect installation, lack of routine maintenance as specified in this manual or modifications of the UV system.

### Glossary

| Term                    | Description                                                                                                        |
|-------------------------|--------------------------------------------------------------------------------------------------------------------|
| Disinfection            | The inactivation of harmful microorganisms                                                                         |
| End of Useful Lamp Life | Recommended time to replace a UV lamp                                                                              |
| Fouling                 | Build up of scale in the vessel, sensor or quartz sleeve                                                           |
| J/m <sup>2</sup>        | Joule per square meter<br>A Unit of UV Dose 10 J/m <sup>2</sup> = 1 mJ/cm <sup>2</sup> = 1,000 uWs/cm <sup>2</sup> |
| UV-C                    | Specific UV area of the light spectrum (200 – 280 nm)                                                              |
| UV System               | Entire UV System that includes the Ballast and UV Vessel                                                           |

## SECTION TWO

# HEALTH AND SAFETY PRECAUTIONS

### Safety Symbols



**Caution**



**Warning**



**Protective Eye wear (UV Light)**



**Recycle**



**High Voltage**



**Chemical (Corrosive)**



**Sharp Object**

### Safety Instructions

#### IMPORTANT SAFETY INSTRUCTIONS PLEASE READ PRIOR TO INSTALLATION AND OPERATION

Strictly follow the instructions within this manual to ensure the health and safety of both, yourself and the UV system. The installation, operation and maintenance of the SafeGUARD™ CLP Series UV Sterilization System can only be carried out after reading and understanding the information contained in this manual.

The installation of the UV system must be carried out in accordance with local regulations and codes.

|                                                                                     |                                                                                                                                                                                                                                                                                             |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | <b>WARNING:</b> Water and electricity can be a dangerous combination. Help us ensure your safety. READ AND FOLLOW ALL SAFETY INSTRUCTIONS.                                                                                                                                                  |
|  | <b>DANGER:</b> UV lamps and quartz sleeves are fragile and if broken and handled incorrectly may cause serious injury.                                                                                                                                                                      |
|  | <b>IMPORTANT:</b> READ AND OBSERVE ALL IMPORTANT NOTICES AND LABELS ON THE UNIT. <b>REMOVAL OF PRODUCT LABEL WILL VOID WARRANTY!</b>                                                                                                                                                        |
|                                                                                     | <b>IMPORTANT:</b> For your safety the quartz sleeve and/or the UV lamp in this product may have been broken or damaged during shipping. It is <b>ESSENTIAL</b> that the unit be <b>CAREFULLY INSPECTED BEFORE CONNECTING TO ELECTRIC POWER.</b>                                             |
|                                                                                     | <b>WARNING:</b> DO NOT exceed 100 PSI during operation.                                                                                                                                                                                                                                     |
|                                                                                     | <b>DANGER:</b> To avoid possible electric shock special care should be taken since water is employed in the use of the UV System. For each of the following situations, do not attempt repairs yourself. Call Pentair Aquatic Eco-Systems, Inc customer service department at 877-347-4788. |
|  | <b>DANGER:</b> If the unit falls into the water, <b>DO NOT REACH FOR IT!</b> First unplug it and then retrieve it. If the internal electrical components of the unit get wet, unplug the unit immediately.                                                                                  |
|                                                                                     | <b>DANGER:</b> If the unit shows any sign of water leakage, immediately unplug it from the power source.                                                                                                                                                                                    |
|                                                                                     | <b>DANGER:</b> DO NOT operate this unit if it has a damaged cord or plug, if it is malfunctioning, or if it has been dropped or damaged in any manner.                                                                                                                                      |

|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>IMPORTANT:</b> Close supervision is necessary when any appliance is used by or near children, this UV system is no exception.                                                                                                                                                                                                                                                                                                                                                                               |
|                                                                                   | <b>IMPORTANT:</b> Always unplug the unit from the electrical outlet when it's not in use, before servicing, cleaning or removing parts. Never yank the cord to pull the plug from the outlet. Grasp the plug and pull to disconnect.                                                                                                                                                                                                                                                                           |
|                                                                                   | <b>IMPORTANT:</b> Each UV system is designed for a specific water-pressure. DO NOT use the UV system for any application other than its intended use. The use of attachments not recommended or sold by Pentair Aquatic Eco-Systems may cause unsafe conditions and possibly void any warranty.                                                                                                                                                                                                                |
|                                                                                   | <b>IMPORTANT:</b> Only (3) three wire grounded cables suitable for outdoor use should be used to connect this unit. If joining cables for outdoor use, a suitable watertight cable connector must be used. If an extension cord is necessary, a cord with a proper rating should be used. A cord rated for less ampere or watts than the appliance's rating may overheat. Care should be taken to arrange the cord so that it will not be tripped over or pulled. If in doubt consult a qualified electrician. |
|                                                                                   | <b>IMPORTANT:</b> Only operate the UV system when it is properly maintained and in good working order.                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                                                                   | <b>IMPORTANT:</b> DO NOT modify the UV system without authorization from Pentair Aquatic Eco-Systems.                                                                                                                                                                                                                                                                                                                                                                                                          |
|  | <b>DANGER:</b> BLUE-LIGHT HAZARD Ultraviolet light will cause serious damage to your eyes and skin! DO NOT handle or stare at an operating UV lamp. UV lamps become hot during operation, DO NOT handle them during operation.                                                                                                                                                                                                                                                                                 |

## Hazardous Situations & Appropriate Actions

| Situation                          | Location  | Hazard                 | Actions                                                                                                                                                                                                  |
|------------------------------------|-----------|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lamp or Quartz Sleeve Removal      | UV Vessel | Burn                   | Isolate UV system from water source, shutdown system using external On/Off switch and lock-out disconnect from input power source.                                                                       |
| Broken Quartz Sleeves/<br>UV Lamps | UV Vessel | Sharp Object           | Handle quartz sleeves and UV lamps with extreme care, wear clean cotton gloves.                                                                                                                          |
| UV Lamp Replacement                | UV Vessel | Blue-Light Hazard      | DO NOT operate UV lamps outside the UV vessel, wear protective eye wear against ultraviolet light.                                                                                                       |
| Drain UV Vessel                    | UV Vessel | Pressure               | Isolate UV system from water source and shutdown system using external On/Off switch and lock-out/disconnect from input power source. Open valves carefully to relieve pressure and drain the UV Vessel. |
| Vessel Cleaning                    | UV Vessel | Corrosive/<br>Chemical | Isolate the UV vessel and secure against unauthorized operation. Wear appropriate protection equipment. No smoking or food allowed.                                                                      |

## SECTION THREE

# UV DISINFECTION

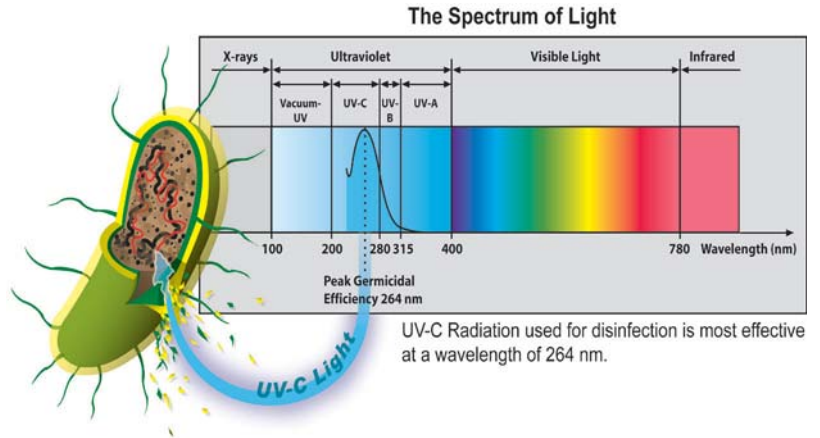
### What is Ultraviolet Light?

Ultraviolet light is a specific section of the Light Spectrum used primarily for germicidal disinfection. It is broken down into four sections: Vacuum UV (100-200 nm), UV-C (200-280 nm), UV-B (280-315 nm) and UV-A (315-400 nm).

### Introduction to UV Disinfection

Ultraviolet light, used in disinfection, is most effective in the UV-C range, specifically between 240 and 280 nanometers. Input watts (voltage + current) are supplied to the UV lamp creating an electrical arc with the mercury inside the lamp's glass envelope. This reaction creates the specific range of UV-C light (240-280 nm) required for germicidal disinfection. Achieving successful UV disinfection requires the UV-C light to penetrate a target microorganism's cell wall/membrane at a specific wavelength (UV Dose) for a specific amount of time (flow-rate).

Ultraviolet disinfection is efficient, economical and environmentally friendly.



### Factors Affecting UV Disinfection

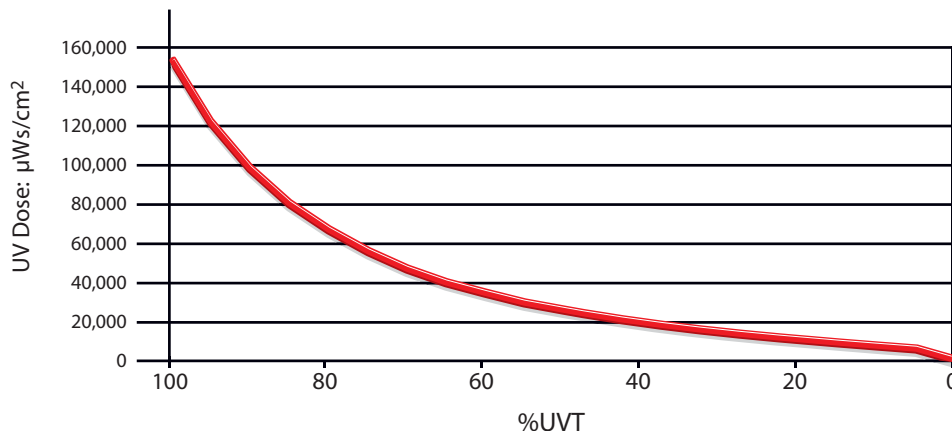
#### Target Microorganism

Microorganisms vary in type, size and life cycle. Selecting a target microorganism (Algae, Bacteria etc.) and identifying its life cycle and established UV Dose are prerequisites for eliminating that particular microorganism.

#### UV Transmittance

The most critical UV performance factor is "UV Transmittance" (UVT). UV light that is absorbed by substances in the water is unavailable to inactivate waterborne microorganisms. The greater the amount of UV light absorbed by these substances (i.e. low %UVT) the more UV capacity will be required. UV transmittance is not turbidity but rather absorption by both visible particles and non-visible substances. For example: metals in water, especially iron, absorb UV light.

These two graphs demonstrate how a lower %UVT parallels a diminished UV dose when operating our model CLP6780A8 (3 – 260 Watt Amalgam UV lamps) at a flow rate of 150 GPM.



| %UVT | $\mu\text{Ws}/\text{cm}^2$ at End of Lamp Life | Total % Loss |
|------|------------------------------------------------|--------------|
| 100  | 151,800                                        | 0%           |
| 95   | 120,800                                        | -20.42%      |
| 90   | 97,400                                         | -35.84%      |
| 85   | 79,600                                         | -47.56%      |
| 80   | 65,900                                         | -56.59%      |
| 75   | 55,100                                         | -63.70%      |
| 70   | 46,500                                         | -69.37%      |
| 65   | 39,600                                         | -73.91%      |
| 60   | 34,000                                         | -77.60%      |
| 55   | 29,300                                         | -80.70%      |
| 50   | 25,400                                         | -83.27%      |
| 45   | 22,000                                         | -85.51%      |
| 40   | 19,200                                         | -87.35%      |
| 35   | 16,700                                         | -89.00%      |
| 30   | 14,600                                         | -90.38%      |
| 25   | 12,700                                         | -91.63%      |
| 20   | 11,000                                         | -92.75%      |
| 15   | 9,400                                          | -93.81%      |
| 10   | 7,900                                          | -94.80%      |
| 5    | 6,400                                          | -95.78%      |

### Quartz Sleeve Condition

Materials (dirt, waste, biofloculant, plant material and scale) all absorb UV light. The more material on the quartz sleeve the greater UV absorption. The result: reduced UV performance. For quartz sleeve cleaning instructions See **Page 34**.



### UV Lamp Performance

A UV lamp degrades over its operating life thus explaining why Pentair Aquatic Eco-Systems™ suggests water flow-rates for our SafeGUARD™ CLP Series UV Sterilization System based on “end of useful lamp life” performance. Your UV System is designed to utilize its lamp’s UV-C output to their maximum potential and should not be modified. Lamps reaching the end of their useful life should be changed-out. UV lamps that are operated past their “end of useful lamp life” can reduce the ballasts operating efficiency.



### Ballast Performance

The ballast/power supply must be sized appropriately to the specific “input watt” requirement of the UV lamp. Under-driving the lamp will result in diminished UV-C output while over-driving the lamp will result in reduced “useful lamp life”.

### Water Flow Rate

The “flow rate” must consider all critical operating criteria for the specific UV system combined with the intended applications percent UV transmissibility (%UVT). Each model UV system and application is unique and therefore must be calculated independently.

### UV System Design

Your UV system is designed and manufactured to deliver many years of dependable operation. The UV system is unique and designed to utilize its UV lamp’s output to their maximum potential. We combine critical performance criteria including: UV lamp output, power supply performance and lamp array. We use the Bolton Photosciences “UV CALC Modeling Program” to verify each UV system’s operating capacity. The Bolton Photosciences UV CALC Modeling Program is recognized by the United States Environmental Protection Agency (EPA).

## SECTION FOUR

---

# INSTALLATION

### Pre-Installation Inspection

#### Purpose

To familiarize the installer/operator with the SMART UV™ MultiLamp Series UV Sterilization System's components, to assure proper delivery of all the system's components and to inspect each component for shipping damages.

#### Frequency

To be conducted prior to installation.

#### Parts and Required Equipment

- Adjustable Wrench or 1.5" Socket
- Box Cutter
- Hammer/Nail Remover
- Flashlight



During pre-installation there is a general risk due to load.



Quartz Sleeves and UV Lamps are fragile and potentially dangerous if broken. Handle with care.

---

#### Procedure

**Note:** UV Lamp(s) are shipped in a separate package either inside the vessel crate or separately.

- 
1. Unpack and inspect vessel for shipping damage. A box cutter or hammer/nail remover may be needed to unpack the UV System.
  2. Conduct an internal, visual inspection of models shipped with their quartz sleeves assembled. A flashlight will help with the internal inspection.
- 

#### The UV System consists of:

- Quartz Sleeve Module (QSM) Faceplate (assembled on Vessel)
- QSM Faceplate Gasket (assembled on Vessel)
- Quartz Sleeve Retainer Nut (one for each quartz sleeve)
- Quartz Sleeve Gasket (one for each quartz sleeve retainer nut)
- Quartz Sleeve (one for each UV Lamp)
- UV Lamp(s)
- Vessel
- Bolt(s) (assembled on Vessel)
- Nut(s) (assembled on Vessel)
- Washer(s) (assembled on Vessel)
- 4-Pin Connector(s) (attached to lamp cables)

## UV Vessel Installation

### Purpose

Proper installation of the UV Vessel achieves expected results and ensures safe operation.

### Frequency

Required with new construction, retro-fit or replacement of outdated equipment.

### Parts and Required Equipment

- Socket Wrenches
- Adjustable Wrenches
- Set of Slotted and Phillips Head Screwdrivers
- Lifting Equipment with Slings
- Vessel Mounting Brackets
- Required Isolation Valves
- Plumbing Components
- Personal Safety Equipment



General risk due to load.



General risk due to pressurized piping or UV Vessel.



Quartz Sleeves are fragile and potentially dangerous if broken. Handle with care.

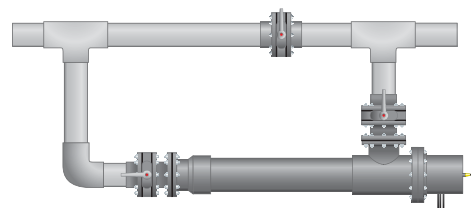
### Procedure

**Important:** The installation of the UV system must be carried out in accordance with local regulations and codes.

1. Install the UV system after the mechanical filtration. This eliminates debris from entering the vessel and diminishing the unit's effectiveness, as well as potentially damaging the quartz sleeves and UV lamps.
2. Install inlet and outlet isolation valves (to be supplied by others).
3. Install UV vessel mounting brackets if required (to be supplied by others).

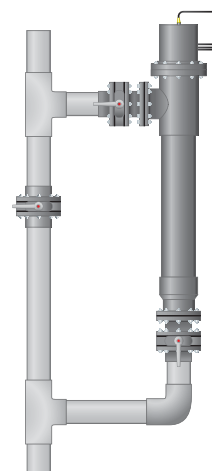
### Horizontal Installation

Horizontal installation requires the vessel outlet port to face upwards, allowing trapped air to escape. If installed on a "by-pass filter loop" or isolated using valves, an automatic air bleed system is required. **Failure to remove trapped air can result in rupture or heat damage to the vessel.**



### Vertical Installation

Vertical installation requires the bottom port to be used as the vessel's inlet and the port closest to the electrical end to be used as the outlet; allowing trapped air to escape. If installed on a "by-pass filter loop" or isolated using valves, an automatic air bleed system is required. **Failure to remove trapped air can result in rupture or heat damage to the vessel.**



SMART UV MULTILAMP

4. Models equipped with inlet/outlet union fittings are ready for piping installation. Models equipped with inlet/outlet raised flanges require mating pipe flanges (not included). Depending on port type ordered, further fabrication may be required by the installer.
5. Isolation Valves are necessary for vessel removal and chemical cleaning procedure. It is recommended to install the isolation valves in conjunction with a separate set of, matching size & type, water port connections to the inlet/outlet ports of the vessel. Adding the “double connection” will enable the UV sterilizer to be removed from the filtration loop without shutting the total filtration system down. If this installation arrangement is not possible, install the unit in a way that chemical cleaners or freshwater rinse can be drained completely from the vessel without contaminating the process water.
6. The vessel is equipped with a 0.5” female threaded drain port for installation of the Drain Valve Assembly. Use Teflon Tape on the threads when installing the drain valve assembly.

## Quartz Sleeve Installation

### Purpose

To thermally protect the UV lamp and isolate it from water.

### Frequency

Quartz Sleeve(s) are installed after being inspected/cleaned or damaged. Water quality conditions may warrant more frequent inspection/cleaning. Fouled quartz sleeves absorb UV light and therefore may reduce the UV intensity. Replace broken quartz sleeve(s).

### Parts and Required Equipment

- Quartz Sleeve(s)
- Quartz Sleeve Retaining Nut Gasket
- Adjustable Wrench
- Cotton or Silicon Gloves
- Personal Safety Equipment



General risk due to electricity.



General risk due to pressurized piping or UV Vessel.



Quartz Sleeves are fragile and potentially dangerous if broken. Handle with care.

---

### Procedure

**Note:** Use clean cotton or silicon gloves when handling the quartz sleeve(s). Skin oils absorb ultraviolet light and reduce UV intensity.

1. Apply water (wet) or a small amount of water soluble lubricant such as Ideal Industries Clear Glide to the domed-end of the quartz sleeve. Lubricating will aid in inserting the domed-end of the quartz sleeve into the vessel's internal quartz sleeve coupler.

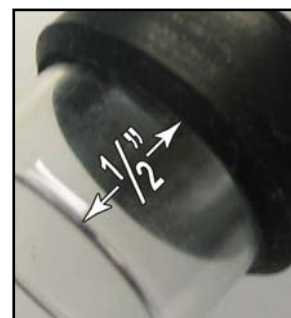
2. Carefully slide the quartz sleeve(s) into the Quartz Sleeve Faceplate's "Quartz Sleeve Module" (QSM) allowing approximately 12" of the quartz sleeve to remain outside the UV vessel.



3. With 12" of the quartz sleeve exposed outside the vessel, carefully place the Quartz Sleeve Rubber Gasket Seal onto the open-end of the quartz sleeve. Apply water or a small amount of water soluble lubricant onto the end of the quartz sleeve, this will act as a lubricant and will allow you to easily slide the Rubber Gasket onto the quartz sleeve.



4. Push the Rubber Gasket onto the quartz sleeve. Position the Gasket approximately 1/2" from the sleeve's open end.



5. As you push the quartz sleeve into the vessel (through the Quartz Sleeve Module) elevate the domed-end of the quartz sleeve by gently pushing down on the open-end approximately 1/2". This will help guide the domed-end of the quartz sleeve into its correct Internal Quartz Sleeve Coupler "Port".

6. Finish sliding the remainder of the quartz sleeve into the vessel until the gasket makes contact with the Quartz Sleeve Module.

As you thread and tighten the Quartz Sleeve Retaining Nut onto the Quartz Sleeve Module the Quartz Sleeve Retaining Nut's internal lip will automatically set the quartz sleeve in its proper position.



7. Using a 1.5" socket or adjustable wrench, tighten the Quartz Sleeve Retaining Nut until snug (5 ft. • lb.). Over-tightening can break the Quartz Sleeve Module on the faceplate or the quartz sleeve inside the UV vessel.



8. The quartz sleeve is now properly assembled, you are now ready to perform a Water Test See **Page 17**.

## SECTION FIVE

# MANDATORY WATER TEST

### Mandatory Water Test

#### Purpose

The Mandatory Water Test identifies a potential quartz sleeve assembly seal failure. During normal UV system operation, a quartz sleeve assembly failure can result in extensive damage to the UV lamp, quartz sleeve and ballast.

#### Frequency

The Mandatory Water Test must be performed after a quartz sleeve/retaining nut gasket inspection/replacement. Quartz Sleeve inspection/retaining nut gasket replacement must be carried out annually, at minimum.

#### Parts and Required Equipment

- Paper Towels
- Personal Safety Equipment



General risk due



UV Lamps are fragile and potentially dangerous if broken. Handle with care.

#### Procedure

**Important:** Failure to perform a water test could lead to unsafe conditions and may void your product's warranties.

1. With the quartz sleeves installed inside the UV vessel, before installation of the UV lamps, perform a water test as explained below. For quartz sleeve removal See **Page 32**. For installation See **Page 12**.



2. Thread all sensors into their respective ports on the UV vessel.

3. Place rolled-up paper towels into the Quartz Sleeve Retaining Nuts. During the water test, the paper towels may absorb moisture. The presence of any moisture identifies that a quartz sleeve seal failure (leak) has occurred.



4. Inspect all piping connections to the UV Vessel and confirm that valves are in their correct position prior to start-up.
5. With satisfactory piping and valve inspection, operate the UV system. Allow water to flow through the UV Vessel for no less than fifteen minutes.
6. After fifteen minutes of flowing water through the UV vessel, remove the paper towel from each Quartz Sleeve Retaining Nut and inspect closely for ANY sign of moisture. If leaks are detected, shut the system down and re-install any quartz sleeve with an inadequate seal. For quartz sleeve removal/installation See **Page 34**.
7. If no leaks were detected you are now ready to install the UV Lamp(s). See **Page 18**.

## SECTION SIX

# UV LAMP INSTALLATION

### UV Lamp Installation

#### Purpose

To instruct the operator how to properly install the UV lamp(s).

#### Frequency

Lamp installation in new unit or lamp replacement change-out (after every 12,000 hours of continual operation).

#### Parts and Required Equipment

- UV Lamp(s)
- Wire Cutters
- Adjustable Wrenches
- Cotton or Silicon Gloves
- Personal Safety Equipment



General risk due to electricity.



UV Lamps are fragile and potentially dangerous if broken. Handle with care.

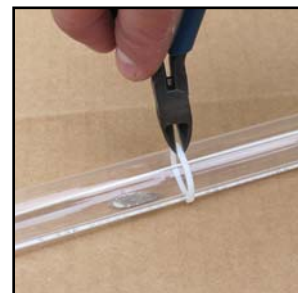
#### Procedure

**Important:** Before installing the UV Lamp(s) a **MANDATORY WATER TEST** must be performed. See **Page 17**.

**Note:** Use clean cotton or silicon gloves when handling the UV lamp(s). Skin oils absorb ultraviolet light and reduce UV intensity. Skin oils may also lead to premature lamp failure.

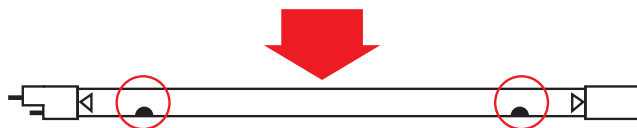
1. Remove the white Teflon “wire keeping” rings from the UV lamp by carefully cutting it off with wire cutters.

**Note:** Be careful not to cut the lamp wires!



2. Gently slide the UV Lamp into the Quartz Sleeve Retaining Nut leaving 6” of the UV lamp exposed.

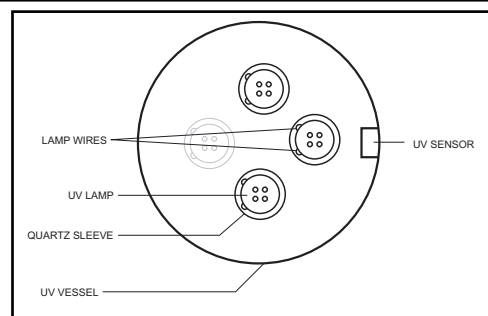
**IMPORTANT:** INSTALL LAMPS WITH AMALGAM SPOT IN DOWN POSITION!



**Note:** Lower wattage amalgam lamps contain a single mass of amalgam while higher wattage amalgam lamps contain multiple masses of amalgam.



**Note:** When installing the lamp into the quartz sleeve position that is monitored by the UV Intensity Sensor, it is important to make sure the lamp wires that run the length of the lamp are not facing the sensor. See diagram, at right for the proper lamp placement.



**Note:** Each Lamp cable (1) is equipped with a Water Tight Connector (2). This cable adapter is made up of three components: Nut (3), Rubber Gasket (4) and Male-Threaded Body (5).



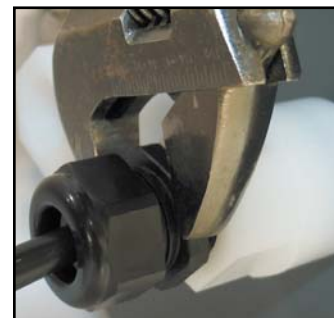
3. Loosen (not remove) the lamp Water Tight Connector nut (3) to release tension on the lamp cable allowing the cable to slide freely through the adapter. This will allow the male-threaded body (5) portion of the lamp Water Tight Connector to be threaded into the white quartz sleeve retaining nut without twisting the lamp cable (after lamp installation).

4. With the UV lamp installed inside the quartz sleeve and six inches exposed, attached the lamp cable's stepped 4-Pin Connector on to the four pins of the UV lamp.

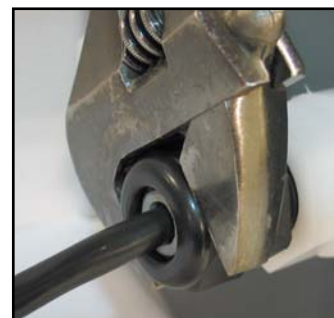


5. With the lamp cable/lamp connection complete gently slide the remainder of the lamp w/ cable through the Quartz Sleeve Retaining Nut and into the quartz sleeve. With the lamp now inside the quartz sleeve, gently continue to push the lamp (w/ connected lamp cable) into the quartz sleeve until it stops, then pull out 1/2" of the lamp cable. This will position the lamp properly inside the quartz sleeve avoiding heat damage to the Quartz Sleeve Module Faceplate and Quartz Sleeve Module.

6. With the UV lamp in its correct position inside the quartz sleeve, thread the water tight connector into the Quartz Sleeve Retaining Nut.



7. With the "black" Water Tight Connector threaded into the Quartz Sleeve Retaining Nut, tighten the Cable Adapter Nut (3) to create a watertight seal on the lamp's cable. Take care not to bend or damage the Water Tight Connector's "gasket prongs" during this process.



8. The UV lamp is now properly installed.

## SECTION SEVEN

# MAINTENANCE

### Routine Inspection

The following are required routine maintenance actions:

- A. Daily inspection of the SafeGUARD™ CLP Series UV Sterilization System's Power Supply Enclosure control panel to confirm that the unit is operating satisfactorily (lamp operation).
- B. Daily visual inspection of the UV vessel and piping for leaks.
- C. Monthly inspection for damage/corrosion.
- D. Annual vessel interior inspection/cleaning.
- E. Biannual quartz sleeve inspection/cleaning.
- F. Replace the UV Lamp & Retaining Nut Gasket after 12,000 hours of continual operation.
- G. Clean or replace the Cooling Fan Filter Mat monthly, or more frequently in dusty environments.
- H. When the lamps are replaced, calibrate the UV Intensity Sensor.

### UV Lamp Replacement

#### Lamp Removal

##### Purpose

To replace expired UV lamp(s)

##### Frequency

A complete set of UV lamps must be replaced after 12,000 hours of continual use (manufacturer's suggested useful lamp life rating) or when the UV Intensity is lower than the PLC threshold value.

##### Parts and Equipment Required

- UV Lamp(s)
- Adjustable Wrench
- Wire Cutters
- Clean Cotton or Silicon Gloves
- Personal Safety Equipment



General risk due to pressurized piping and UV vessel!



General risk due to electricity!



DO NOT operate UV Lamp(s) outside of the vessel. UV light may cause severe irritation/damage to eyes and skin.



UV lamp(s) become hot during operation. Handle with care.



UV Lamps are fragile and potentially dangerous if broken. Handle with care.

#### Procedure

Read and understand this chapter prior to performing lamp change-out

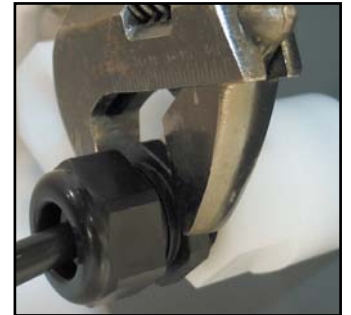
**Note:** Use clean cotton or silicon gloves when handling the UV lamp(s). Skin oils absorb ultraviolet light and reduce UV intensity. Skin oils may also lead to premature lamp failure.

1. Turn off the Power Supply Enclosure with the External ON/OFF Switch and unplug the UV system from the electrical outlet.

2. With an adjustable wrench loosen (not remove) the Lamp Cable Adapter Nut that will allow the complete Water Tight Connector fitting to be unthreaded from the Quartz Sleeve Retaining Nut without twisting the lamp cable.



3. Unthread the Water Tight Connector Fitting from the Quartz Sleeve Adapter Nut.



4. Carefully slide the lamp cable's adapter fitting and lamp out of the quartz sleeve (through the Quartz Sleeve Retaining Nut). With part of the UV lamp outside of the vessel, disconnect the lamp cable's 4-Pin Connector from the UV lamp. Use caution connecting/disconnecting UV lamps in vessels mounted vertically. To prevent breakage, be careful not to drop the UV lamps into the quartz sleeve(s). *UV Lamps may be hot, handle with care.*



5. With the lamp disconnected from the 4-Pin Connector, carefully slide the lamp out of the quartz sleeve and place in a safe location to avoid breakage.

## UV Lamp Recycling

Pentair Aquatic Eco-Systems™ offers a "Hazardous Waste Disposal Service" for Mercury Vapor UV Lamps. This service is intended to provide our customers with disposal service in compliance with State and Federal standards. This service may be utilized by our customers who are environmentally responsible and legally required. Your Pentair Aquatic Eco-Systems Sales Representative can assist you with this service call 877-347-4788.



## Lamp Installation

See **Page 11** for UV Lamp installation procedure.

## Quartz Sleeve Inspection/Replacement/Cleaning

### Quartz Sleeve Removal

#### Purpose

To inspect or replace broken quartz sleeve(s) in order to maintain required/expected UV intensity.

#### Frequency

Quartz Sleeve(s) should be removed, inspected and cleaned at least once annually (water quality conditions may warrant more frequent inspections/cleaning). Fouled quartz sleeves absorb UV light and therefore may reduce the UV intensity.

## Parts and Equipment Required

- Quartz Sleeve(s)
- Quartz Sleeve Retaining Nut Gasket
- Adjustable Wrench
- Clean Cotton or Silicon Gloves
- Personal Safety Equipment



General risk due to pressurized piping and UV vessel!



General risk due to electricity!



Quartz Sleeves are fragile and potentially dangerous if broken. Handle with care.

---

## Procedure

1. Turn off the Power Supply Enclosure with the External ON/OFF Switch and unplug the UV system from the electrical outlet.
  2. Drain the vessel completely.
  3. Remove UV lamp(s). See **Page 13** for instructions.
- 

4. Using a 1.5" socket or an adjustable wrench, unthread the Quartz Sleeve Retaining Nut from the male-threaded Quartz Sleeve Module located on the QSM Faceplate. Once the Quartz Sleeve Retaining Nut is unthreaded the open-end of the quartz sleeve will be exposed.



5. Wearing clean cotton or silicon gloves gently slide the quartz sleeve from the UV vessel. DO NOT use pliers or any tools that may break the quartz sleeve.



6. Remove the Quartz Sleeve Gasket and continue removing the quartz sleeves until all are removed from the vessel. Place quartz sleeves on a safe, level surface to avoid breakage.



7. Inspect all quartz sleeves for cracks, chips and scaling. If required, clean the quartz sleeve(s). See **Page 34** Quartz Sleeve Cleaning. Replace damaged (cracked, chipped) quartz sleeves.

## Quartz Sleeve Cleaning

### Purpose

To manually check and clean quartz sleeve(s).

### Frequency

When required, at least once annually.

### Parts and Equipment Required

- Cleaning Agent (dish detergent, acid cleaning agent based upon phosphoric acid (>25%) or commercially available cleaners such as: Lime-A-Way or CLR in a sufficient quantity to fill the vessel)
- Acid-Proof Bucket
- Clean Cloth
- Acid-Proof Drop Cloth
- Acid-Resistant Gloves
- Freshwater
- MSDS Sheet
- Personal Protective Equipment



General risk due to pressurized piping and UV vessel!



General risk due to caustic cleaning agent!



Quartz Sleeves are fragile and potentially dangerous if broken. Handle with care.

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### First Aid Measures:



In case of skin exposure to cleaning agent remove by washing with soap and water immediately.

In case of eye exposure to cleaning agent wash eyes for several minutes with water and contact a physician immediately.

In case of ingestion of cleaning agent contact physician immediately.

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### Procedure

1. See **Page 32** for quartz sleeve removal instructions.
2. Inspect quartz sleeve and clean as needed with a soft, clean cloth and mild dish detergent.
3. For calcium deposits use soporific or muriatic acid to dissolve/clean deposits.
4. Rinse quartz sleeve thoroughly with clean freshwater.
5. See **Page 12** for quartz sleeve installation instructions.

## Quartz Sleeve Installation

See **Page 12** for quartz sleeve installation procedure.

## UV Vessel Cleaning

### Purpose

Over a period of time, dissolved matter can build up on the surface of the quartz sleeves and the interior of the vessel affecting the efficiency of the UV disinfection process. Due to fouling, the available intensity will decrease continuously (Note: The use of the optional wiping system merely helps to decrease the frequency of the manual cleaning cycle). Please be aware that such a decrease also may be caused by ageing of the UV lamps or changes in the water quality (UV transmission). Repeat of visual inspections of the UV Sensor or of some example quartz sleeves will help to determine the necessary cleaning intervals needed. The removal of this build-up (calcium, etc.) can be carried out with a cleaning pump. A cleaning agent based upon phosphoric acid like citric acid or commercially available cleaners such as Lime-A-Way or CLR may be used. Materials within the vessel chamber are highly resistant against these chemicals.

## Frequency

When necessary.

## Parts and Equipment Required

- Cleaning Agent (dish detergent, acid cleaning agent based upon phosphoric acid (>25%) or commercially available cleaners such as: Lime-A-Way or CLR in a sufficient quantity to fill the vessel)
- Acid-Resistant Transfer Pump
- Acid-Resistant Hose (used to transfer the cleaner from the container to the UV vessel)
- Fittings to connect to vessel
- Acid-Resistant Bucket
- Clean Cloth
- Acid-Resistant Drop Cloth
- Acid-Resistant Gloves
- Freshwater
- MSDS Sheet
- Personal Safety Equipment



General risk due to pressurized piping and UV vessel.



General risk due to caustic cleaning agent.



Quartz Sleeves and UV lamps are fragile and potentially dangerous if broken. Handle with care.

### First Aid Measures:

In case of skin exposure to cleaning agent remove by washing with soap and water immediately.



In case of eye exposure to cleaning agent wash eyes for several minutes with water and contact a physician immediately.

In case of ingestion of cleaning agent contact physician immediately.

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## Procedure

1. With the quartz sleeves still installed in the UV vessel, turn off the Power Supply Enclosure with the External ON/OFF Switch and unplug the UV system from the electrical outlet.
2. Isolate the UV vessel from the water flow using the required isolation valves and drain the vessel completely.
3. Clear the work area and layout protective drop cloths under the UV vessel.
4. Set up the acid transfer pump and attach the acid input hose to the vessel's water drain valve.
5. Attach an acid return/overflow hose to the UV vessel's upper auxiliary service port and route it back to the acid-resistant bucket. This will be used as the Acid Overflow Recovery Bucket.
6. With all of the hoses attached to the UV vessel and the acid transfer pump attached to the acid supply container, pump acid into the UV vessel until full.
7. Once the UV vessel has been filled with acid, allow the acid to remain in the vessel for 30 minutes.
8. Disconnect the acid transfer pump's vessel feed hose from the transfer pump and use this hose to drain the acid from the UV vessel through the vessel's drain valve and into an acid-resistant bucket.
9. After all of the acid has been drained from the UV vessel and the cleaning procedure completed, rinse the vessel chamber thoroughly to avoid process water from coming in contact with the cleaning agent. The rinse water may be taken from a water tap with the help of a hose and filled and drained through the unit's drain valve port.
10. Neutralize old cleaning agent with bases, e.g. sodium hydroxide solution, sodium carbonate solution in compliance with all relevant rules for accident prevention and local regulations.

## UV Vessel Disassembly

### Purpose

To disassemble the vessel for internal inspection.

### Frequency

UV vessel disassembly is only required if a problem has taken place, such as, quartz sleeve breakage. It is recommended that the QSM (Quartz Sleeve Module) Faceplate only be removed if necessary.

### Parts and Equipment Required

- Adjustable and Torque Wrenches
- Socket Wrenches
- Clean Cotton or Silicon Gloves
- Flashlight
- Personal Safety Equipment



General risk due to pressurized piping and UV vessel!



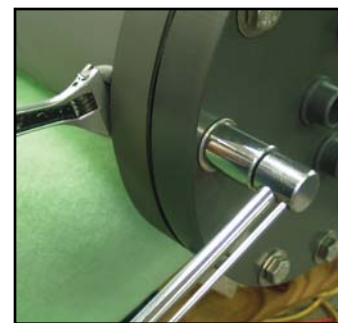
Quartz Sleeves and UV lamps are fragile and potentially dangerous if broken. Handle with care.

### Procedure

**Important:** DO NOT Attempt to remove the QSM Faceplate with the quartz sleeves assembled. ALL lamps and quartz sleeves MUST be removed before disassembling the QSM Faceplate from the UV vessel.

1. Turn off the Power Supply Enclosure with the External ON/OFF Switch and unplug the UV system from the electrical outlet.
2. Redirect water flow from the vessel using isolation valves and drain the vessel completely.
3. Remove UV lamp(s). See **Page 32** for removal instructions.
4. Remove quartz sleeve(s). See **Page 32** removal instructions.

5. With the vessel completely drained and the UV lamps and quartz sleeves removed, loosen the QSM Faceplate bolts in a diametric sequence. Continue until all hardware is removed.



6. With fastening hardware removed, pull the QSM Faceplate from the UV vessel.
7. Clean out the inside of the UV vessel using a mild dish detergent and rinse thoroughly with clean freshwater.
8. Thoroughly clean the mating surfaces of both the QSM Faceplate and the UV Vessel.

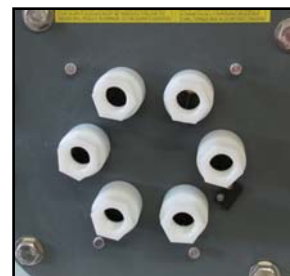
**Important:** Use a new QSM Faceplate Rubber Gasket when re-assembling the faceplate to the vessel.

For replacement parts please refer to Replacement Parts list on page 39 of this manual.

9. Fit the QSM Faceplate Rubber Gasket onto the alignment posts.



**Important:** To properly align the QSM Faceplate, set the #1 lamp position (as stamped on the faceplate, next to the quartz sleeve module) to the 3 O' Clock position when looking at the QSM Faceplate.



10. With the QSM Faceplate loosely aligned, push the QSM Faceplate, with the rubber gasket, in place onto the vessel. Next, loosely install (finger tight) the supplied stainless steel hardware (bolts/washers/nuts).



11. With the hardware loosely installed (finger tight) fine tune the alignment of the #1 lamp position to the 3 O' Clock position. To verify proper alignment install the #1 quartz sleeve as outlined on **Page 12**. The sleeve should go into its respective port on the quartz sleeve coupler on the opposite end of the unit without difficulty. If when installing the sleeve you find it difficult to get the sleeve to engage in its respective port on the quartz sleeve coupler this is an indication that the #1 lamp position is not aligned properly in the 3 O' Clock position. If this is the case, rotate the QSM Faceplate either clockwise or counterclockwise until the sleeve freely engages its respective port on the quartz sleeve coupler.

12. Once the #1 lamp position is confirmed to be properly aligned, establish uniform pressure over the QSM Faceplate by tightening the bolts in 5 ft. • lb. increments in a diametrically opposed (180°) sequence until the recommended torque is obtained. See recommendations below.

Flange Bolt Torque Recommendations:

0.5" to 1.5" Flange = 12 ft. • lbs.

10" Flange = 64 ft. • lbs.

2.0" to 4.0" Flange = 25 ft. • lbs.

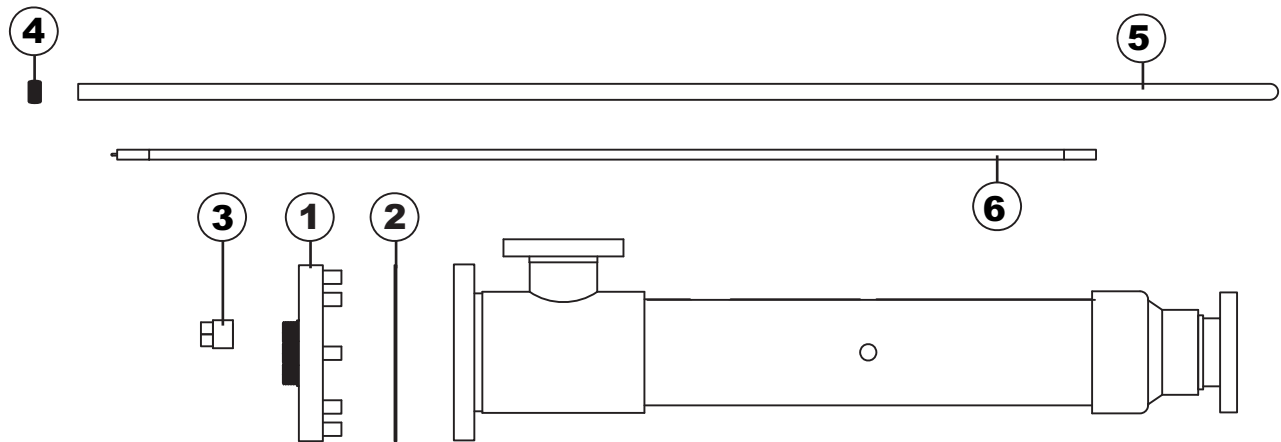
12" Flange = 95 ft. • lbs.

5.0" Flange = 30 ft. • lbs.

14" to 24" Flange = 40 ft. • lbs.

6.0" to 8.0" Flange = 40 ft. • lbs.





### Replacement Parts

|    |                                     |                                                                                                                                       |
|----|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Quartz Sleeve Module Faceplate..... | CLPHO-2-6BF                                                                                                                           |
| 2. | QSM Faceplate Rubber Gasket.....    | 17-060                                                                                                                                |
| 3. | Quartz Sleeve Retainer Nut.....     | CL-QSR-28                                                                                                                             |
| 4. | Quartz Sleeve Gasket.....           | CL28-QSRG-10P                                                                                                                         |
| 5. | QuartzSleeve.....                   | 0250100 Watts FL-QZ175-IP<br>0250160 Watts FL-QZ183<br>0250240 Watts FL-QZ165<br>0250300 Watts FL-QZ167<br>0250450/600 Watts FL-QZ169 |
| 6. | UVLamp.....                         | 0250100 Watts FL-2538-IP<br>0250160 Watts FL-2997-IP<br>0250240 Watts FL-2998-IP<br>0250300/450/600 Watts FL-2999                     |

## SECTION EIGHT

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# TROUBLESHOOTING

**SITUATION****INSPECT FOR:**

UV system will not function

1. No Input Voltage Available

UV Lamp does not light

1. Faulty Contact (four-pin connector/lamp pins)
2. Defective Electronic Ballast
3. Defective UV Lamp
4. Water Damage due to Quartz Sleeve Seal Failure

Quartz Sleeve Seal Failure

1. Cracked/Broken Quartz Sleeve
2. Failed Quartz Sleeve Retaining Nut O-Ring Seal





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